BIO Aktuell.ch

# Grain legumes: opportunities and pitfalls of chickpeas, lentils and lupins

Plant proteins are becoming increasingly important in view of the climate crisis. Pulses play an important role in this, but are still a niche crop in Switzerland. The Organic Grain Legumes Field Day provided an insight into research into chickpeas, peas, lentils, lupins and chickpeas.

The consequences of the climate crisis are also becoming increasingly noticeable in Switzerland. Food contributes significantly to greenhouse gas emissions and a reduction in meat consumption has clear benefits for the climate. This is another reason why plant-based proteins are increasingly coming into focus. Among the plants, grain legumes are particularly rich in protein. These include peas, beans, lentils and all other pulses whose seeds are utilised. These plants were the focus of the Organic Grain Legumes Field Day on 5 June, organised by Peter Kunz Cereal Breeding (gzpk), Agroscope and FiBL. Current research trials, results and challenges were presented at the Rinderbrunnen farm in Grüt, ZH and the gzpk trial fields in Feldbach.

## Which varieties really prove their worth?

While the industry has already done a lot of breeding work on cereals, variety development for many grain legumes in Switzerland is still in its infancy. For example, gzpk's pea varieties, which are characterised by their suitability to the site and their suitability for extensive farming, are only about to be registered for state testing.
Stephan Gysi from the Rinderbrunnen farm is working with gzpk to test flat peas, peas and chickpeas in variety trials. His experience shows that chickpea varieties with a dark-coloured seed coat grow better in the often wet and cold Swiss spring conditions. "The plants with a more robust, dark-coloured seed coat seem to be more resistant," says Gysi. However, sales are difficult as customers are used to light-coloured chickpeas. The Integral project with gzpk aims to develop solutions to such problems along the value chain.
According to Gysi, the brown-shelled Olga variety is developing particularly promisingly. For those who prefer light-skinned chickpeas, however, Gysi

recommends the Flamenco variety: "It sprouted well under this year's conditions." However, a germination test in the laboratory is still pending. This will show whether the differences are actually due to the varieties or to the different quality of the seed.

## Mixed cultivation has advantages

The cultivation of grain legumes in pure culture is often difficult because the plants are often stored. As a result, they weed out and are difficult to harvest, which leads to lower yields. Mixed cultivation with cereals has therefore proved successful. The cereal supports the legume, helps to suppress weeds and benefits from the legume's nitrogen fixation. As part of the Cropdiva and Legendary projects, Susanne Vogelgsang and her doctoral students at Agroscope are investigating various mixtures, including the combination of lentils with naked barley or lupins with oats. The aim of the EU projects is to promote the cultivation of these previously underutilised arable crops in Switzerland and thus strengthen agrobiodiversity. The trials show that completely different requirements apply to varieties in mixed cultivation. In contrast to pure cultivation, barley, for example, has the task of supporting the lentil. At the same time, it should not overcrop so as not to compete too much with the lentil. Stephan Gysi therefore also selects low-growing varieties that provide support for the lentil without shading it too much.
The time of ripening is also crucial, as both crops are harvested at the same time. Agroscope doctoral student Filippo Carmenati shows a mixed crop trial with lentils and naked barley and emphasises the importance of variety selection. The suitability of pulses for intercropping can be taken into account at the breeding stage, explains Barbara Dolder, breeder at gzpk.
If cultivation is successful, Gysi harvests around 2 tonnes of barley and 3 tonnes of lentils per hectare. The area is therefore more productive than if only one crop were grown. However, as the crops have to be separated, it is important that the grains differ in shape, size and colour.

## Lupin - promising but challenging to grow

One crop on which many hopes are pinned is the white lupin. It is the next most protein-rich grain legume after the soya bean and has a good amino acid pattern. It also leaves a lot of nitrogen in the soil for the following crop, its flowers are valuable for pollinators and it can mobilise available phosphate in the soil via its roots. However, the cultivation of white lupin also has its pitfalls. The plant is susceptible to the fungal disease anthracnose, which can lead to large yield losses. In addition, many varieties produce bitter substances that are toxic to humans and animals. Ronald Fischer from the Aaretal Feldprodukte association has registered for the field day to find out about research into white lupins. The association has been producing lupins for "New Roots", a manufacturer of vegan alternative products, for a year now. However, the variety requested by the customer is susceptible to anthracnose.

"The cultivation of white lupins is currently still associated with major risks," says Fischer, "if the fungus rages or the seeds develop too many bitter substances, we can practically plough under the harvest."

Fischer is therefore particularly interested in FiBL's findings on the fungal tolerance of lupins and the Bio Suisse LupiSweet project, which is investigating the development of bitter substances. Tests are also being carried out to see whether a colour selection device can sort out bitter seeds. "If we can solve the agronomic problems, the white lupin is the ideal native protein source for the production of vegan products," Ronald Fischer is convinced. FiBL and gzpk are working together on the breeding of the white lupin as part of the Lupinno Suisse project. And in the EU project LiveSeeding, various varieties of white lupin are being evaluated using the digital tool SeedLinked.

Narrow-leaved lupins are more tolerant to anthracnose, but are less effective at suppressing weeds thanks to their more delicate leaves. The mixed cultivation with oats in the Cropdiva project shows a promising approach here. The particularly low-alkaloid variety Jowisz/Jupiter forms convincing weed-free stands when mixed with a low-growing oat variety. One key to success was the early sowing in mid-March. Agroscope doctoral student Yannik Schlup, who supervised the trial, even recommends sowing narrow-leaved lupin as early as February if conditions are favourable.

The culinary highlight of the day was a tasting of the Italian "farinata", a flatbread traditionally made from chickpeas in three varieties: chickpeas, peas and flat peas from the Divinfood project. Lupins were available to try as a snack in the form of whole beans, as crackers and as a spread.

Corinne Obrist, FiBL